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***Bluetooth*[®] low energy Module**

Bluetooth[®] 4.2 low energy

EYSGCNAWY-1X

Data Report

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EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

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Revision History

14-Sep.-2015 > Ver.1.00 Release
 21-Dec.-2015 > Ver.1.01 Update
 18-Mar.-2016 > Ver.1.1 Update
 12-Jul.-2016 > Ver.1.2 Update
 09-Aug.-2016 > Ver.1.3 Update
 06-Feb.-2017 > Ver.1.4 Update
 25-May-2017 > Ver.1.5 Update
 30-Jun.-2017 > Ver.1.6 Update

EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A150104	(1/5)	Control name General Items
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Scope

This specification ("Specification") applies to the hybrid IC "EYSGCNAWY-1X", a **Bluetooth**[®] 4.2 low energy module ("Product") manufactured by TAIYO YUDEN Co., Ltd. ("TAIYO YUDEN")

1. Type: EYSGCN

User Code: EYSGCNAWY-1X

*User Code may be changed for mass production or other cases.

2. Function:

Radio frequency module. **Bluetooth**[®] standard Ver 4.2 low energy conformity

3. Application: Health & Fitness Equipment, Sensor, Toys

4. Structure:

Hybrid IC loaded with silicon monolithic semiconductor

Compatible with industrial standard reflow profile for Pb-free solders

Can meet with RoHS compliance (Pb, Cd, Hg, Cr⁺⁶, PBB, PBDE)

5. Outline: 12.9x 9.6 x 2.0 mm

49-pin Land Grid Array

6. Marking: Part number, Lot number, Japan ID, FCC ID, IC ID

7. Features:

- Small outline by PCB substrate
- Low power consumption
- Integrated antenna
- Integrated system and sleep clock
- **Bluetooth**[®] 4.2 low energy conformity
 - Slave or Master Role

8. Packaging:

Packaging method: Tape & reel + aluminum moisture barrier bag

Packaging unit: 1000

*It might be provided as tray at sample stage.

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EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A150104	(2/5)	Control name General Items
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9. Note:

- a. Any question arising from this Specification shall be solved through mutual discussion by the parties hereof.
- b. This Product is not designed to be radiation durable and should not be used under the circumstance of radiation.
- c. The operating conditions of this Product are as shown in this Specification. Please note that TAIYO YUDEN shall not be liable for a failure and/or abnormality which is caused by use under the conditions other than the operating conditions hereof.
- d. The Product mentioned in this Specification is manufactured for use in Health & Fitness Equipment, Sensor and Toys. Before using this Product in any special equipment (such as medical equipment, space equipment, air craft, disaster prevention equipment), where higher safety and reliability are duly required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and safe operation of these special equipments. Also, evaluation of the safety function of this Product even for use in general electronics equipment shall be thoroughly made and when necessary, a protective circuit shall be added during the design stage, all at the customer's sole risk.
- e. a) You are requested to fully check and confirm by the start of mass production of this Product that (1) no bug, defect or other failure is included in firmware incorporated in this Product ("Incorporated Software"), (2) no bug defect or other failure arising from installation of this Product in which is contained Incorporated Software into your products is included in Incorporated Software, and that Incorporated Software fully meets your intended use, although TAIYO YUDEN sufficiently inspects or verifies quality of Incorporated Software.
b) Please note that TAIYO YUDEN is not responsible for any failure arising out of bugs or defects in Incorporated Software.
- f. TAIYO YUDEN warrants only that this Product is in conformity with this Specification for one year after purchase and shall in no event give any other warranty.
- g. Communication between this Product and others might not be established nor maintained depending on radio environment or operating conditions of this Product and other *Bluetooth*[®] products.
- h. In order to test for Radio Law certification with a device incorporating this module, the Host Software must be able to put the module into test mode. Please contact TAIYO YUDEN for further details.
- i. This Product operates in the unlicensed ISM band at 2.4GHz. In case this Product is used around the other wireless devices which operate in same frequency band of this Product, there is a possibility that interference may occur between this Product and such other devices. If such interference occurs, please stop the operation of other devices or relocate this Product before using this Product or do not use this Product around the other wireless devices.
- j. Please thoroughly evaluate our module with your products before going mass production.
- k. User Code Modification Notice.
User Code for sample modules or part numbers in this Specification are TAIYO YUDEN standard part numbers. When any modification is made to a module to meet requested specifications, the part number will be changed. Please contact TAIYO YUDEN to confirm whether your part number needs to be modified.
Please see the following examples for cases when part numbers are modified:
 - for specific firmware version (our standard item firmware will be upgraded occasionally)
 - for other relevant cases (specific or different setting, form, sizes, or display etc..)

TAIYO YUDEN CO., LTD.

EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A150104	(3/5)	Control name General Items
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- l. Alternative components may used to this module. The intended components is used within the warranty written in this document (characteristics, size, operating condition, reliability, public regulation such as radio type approval) and Taiyo Yuden confirmed there are not any problems with the replacement. The traceability of the components is secured each production lot.
- m. Caution for Export Control
This Product may be subject to governmental approvals, consents, licenses, authorizations, declarations, filings, and registrations for export or re-export of the Product, required by Japanese Foreign Exchange and Foreign Trade Law (including related laws and regulations) and/or any other country's applicable laws or regulations related to export control.
If you plan to export or re-export this Product, it is strongly recommended that you check and confirm, the necessary procedures to export or re-export of this Product as required by applicable laws and regulations, and if necessary, you have to obtain necessary and appropriate approvals or licenses from governmental authority at your own risk and expense.
- n. Japan Regulatory Information
This module is approved with the specific antenna on this module.
a) Please ensure that your product can bear a label with the following information. If the product is so small that it is not practicable to place the label, please place it in the instruction manual and package.
This product installs a radio system which has been approved as a radio station in a low power data communication system based on the Radio Law.
EYSGCN : 001-A06158
- o. Canada Regulatory Information
a) This device complies with Industry Canada license-exempt RSS standards. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire de brouillage et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.
b) This product is certified as type of the portable device with Industry Canada Rules. To maintain compliance with RF Exposure requirement, please use within specification of this product.
Ce produit est certifié comme type de l'appareil portable avec Industrie Règles de Canada. Pour maintenir l'acquiescement avec exigence Exposition de RF, veuillez utiliser dans spécification de ce produit.
- IC: 4389B-EYSGCN
c) Please notify certified ID by either one of the following method on your product.
Specifiez ID certifiée dans votre produit par une de méthode suivante.
-Contains Transmitter module IC : 4389B-EYSGCN
-Contains IC : 4389B-EYSGCN

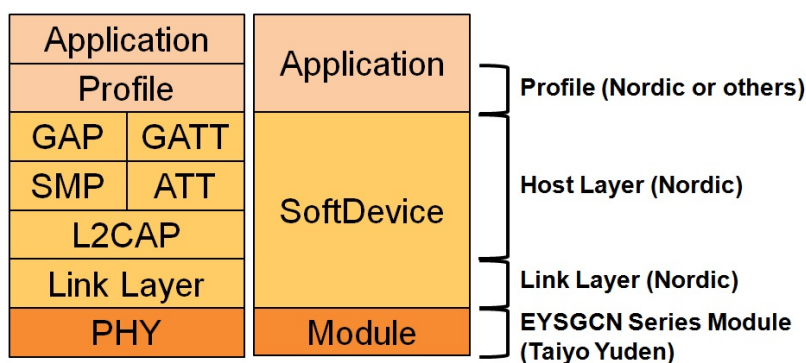
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EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A150046	(4/5)	Control name General Items
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- p. FCC Regulatory Information
 - a) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
 - b) Please notify certified ID by either one of the following method on your product.
 - Contains Transmitter Module FCC ID: RYYEYSGCN
 - Contains FCC ID: RYYEYSGCN
 - c) CAUTION: changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment.
 - d) This product is certified as type of the portable device with FCC Rules. To maintain compliance with RF Exposure requirement, please use within specification of this product.
 - e) The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- q. CE Regulatory Information
 - a) When your end product installs this module, it is required to proceed additional certification processes before placing on the market in EU member states to make your products fully comply with relative EU standards.
 - b) TAIYO YUDEN can provide you the test reports of conducted measurement portion for the radio module. You can utilize the test reports for the certification processes of your end product as it requires radio testing.
- r. This Product is designed for use in products which comply with *Bluetooth*[®] Specifications (Ver 4.2 LE) ("Bluetooth Specifications"). TAIYO YUDEN disclaims and is not responsible for any liability concerning infringement by this Product under any intellectual property right owned by third party in case the customer uses this Product in any product which does not comply with Bluetooth Specifications (the "non-complying products"). Furthermore, TAIYO YUDEN warrants only that this Product complies with this Specification and does not grant any other warranty including warranty for application of the non-complying products.
- s. EYSGCN series module is qualified as PHY only with Component category by Bluetooth SIG. The QDID of this module is 72109. The final product needs to get qualification as End product combining with PHY (module), SoftDevice and Profile before selling the product. The QDID of this product is Link Layer Master : 54056, Slave : 61110 and Host Layer Master : 66320, Slave : 56948. Please refer to following combination and consult with your qualification body and BQE.



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EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A150046	(5/5)	Control name General Items
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The use of Embedded Software
Before using this product.

Please kindly read carefully and understand the following before using the Products.

1. Taiyo Yuden Co., Ltd. (hereinafter "TY"), lawfully has copyrights and other rights to the software embedded to the memory of the Products (the "Embedded Software"). Except as otherwise expressly provided herein, your company is not permitted to disclose or offer the Embedded Software, either wholly or partly, to any third party (including uploading to your company or third party (ies)'s web sites and downloading by third parties from such sites), nor to copy, revise, reverse engineer, upgrade, make specification change, or alienate the Embedded Software.
2. Before using the Products, you need to check and confirm sufficient safety and operation of your products which incorporate the Products and interoperability and compatibility with other Bluetooth[®] enabled products.
3. TY have not evaluated and confirmed the interoperability, compatibility, etc. of the Products (including Embedded Software) with every kind of Bluetooth[®] enabled product. In addition, TY does not guarantee interoperability and compatibility of the Product with certain devices. In order to minimize the damage or harm arising out of the Potential Failure or out of combination with other devices, TY recommend your company set up interface or external pin (for detail, please refer to Specification " Pin Layout " of this document) for rewriting the Embedded Software.

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EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AM-A150104	(1/1)	Control name Absolute maximum ratings
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Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Units
VCC_NRF		-0.3	+3.6	V
GND			0	V
VIO		-0.3	VCC_NRF+ 0.3	V
Storage temperature		-40	+85	Deg-C
MSL	Moisture Sensitivity Level	3		
ESD HBM	Human Body Model		1	kV
ESD MM	Machine Model		100	V
Endurance	Flash Memory Endurance	20000		write/erase cycles
Retention	Flash Memory Retention	10 years		At 40 deg-C
Number of times an address can be written between erase cycles			2	times

EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AE-A150104	(1/2)	Control name Electrical characteristics
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Electrical characteristics**Recommendation operating range**

Symbol	Parameter	Min.	Typ.	Max.	Units
VCC_NRF	Supply voltage, normal mode	1.8	3.0	3.6	V
tR_VCC_NRF	Supply rise time (0V to 1.8V)*1			100	ms
TA	Operation temperature	-25	25	85	Deg-C

*1 The on-chip power-on reset circuitry may not function properly for rise times outside the specified interval. Also after power off, it must start up from below 0.3V. The on-chip power-on reset circuitry may not function properly.

DC Specifications

The Specification applies for Topr.= 25 degrees C, VCC_NRF = 3.0V

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
VIH	Input high voltage	0.7 VCC_NRF		VCC_NRF	V
VIL	Input low voltage	GND		0.3 VCC_NRF	V
VOH	Output high voltage (std. drive, 0.5 mA)	VCC_NRF-0.3		VCC_NRF	V
VOH	Output high voltage (high-drive, 5 mA)	VCC_NRF-0.3		VCC_NRF	V
VOL	Output low voltage (std. drive, 0.5 mA)	GND		0.3	V
VOL	Output low voltage (high-drive, 5 mA)	GND		0.3	V
RPU	Pull-up resistance	11	13	16	kohm
RPD	Pull-down resistance	11	13	16	kohm
ITX,+4dBm	TX only run current @ POUT =+4 dBm		16		mA
IRX	RX only run current		13		mA
IOFF	Current in SYSTEM-OFF, no RAM retention		0.6		uA
RSTR	RESET High to Module Ready		300	600	ms
RPW	RESET Pulse Width		5		ms

UART specifications

Symbol	Description	Min.	Typ.	Max.	Units
f _{UART}	Baud rate for UART		38400		bps

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EYSGCNAWY-1X

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Control No. HD-AE-A150104	(2/2)	Control name Electrical characteristics
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RF Specifications

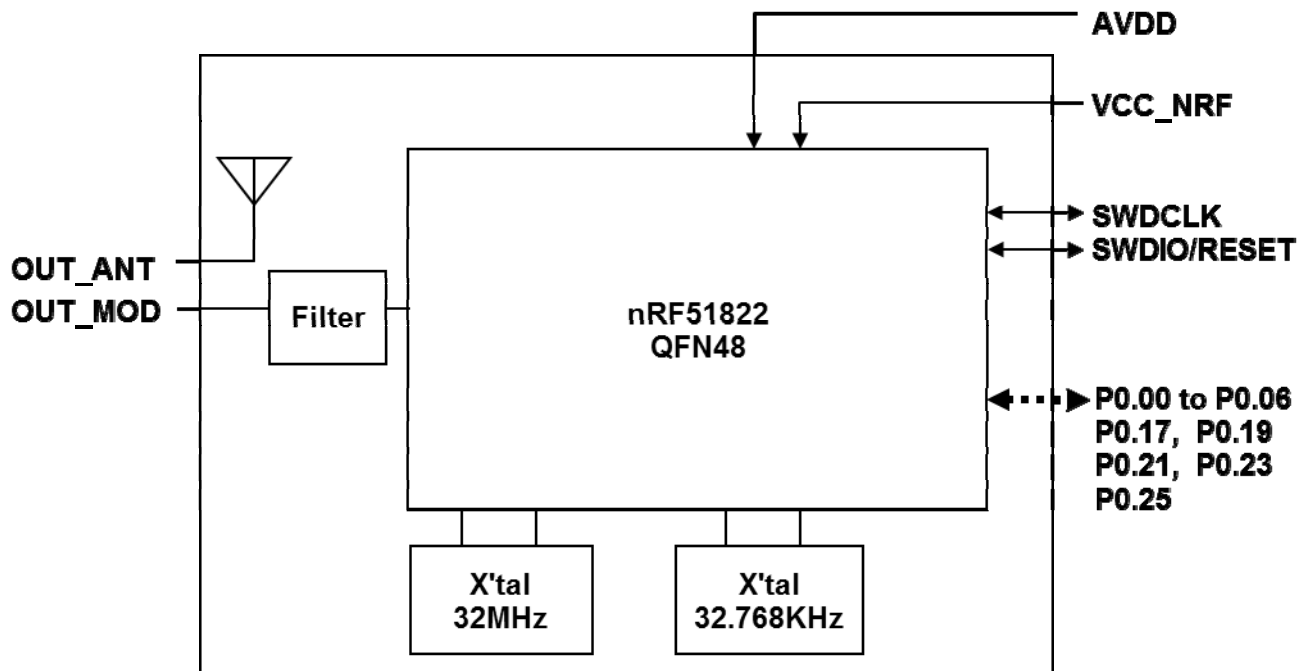
Symbol	Description	Min.	Typ.	Max.	Units
Fop	Operating frequencies	2402		2480	MHz
Df	Frequency deviation	+/-225	+/-250	+/-275	kHz
PRF	Maximum output power		4		dBm
PRFCR	RF power accuracy			+/-4	dB
PBW	20 dB bandwidth for modulated carrier		950	1100	kHz
PRF1	1st Adjacent Channel Transmit Power 1 MHz			-20	dBc
PRF2	2nd Adjacent Channel Transmit Power 2 MHz			-45	dBc
PRXMAX	Maximum received signal strength at < 0.1% PER		0		dBm
PSENS IT	Receiver sensitivity (0.1% BER) Ideal transmitter		-93		dBm
PSENS DT	Receiver sensitivity (0.1% BER) dirty transmitter		-91		dBm

EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-MC-A150104	(1/3)	Control name Circuit Schematic
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Block Diagram



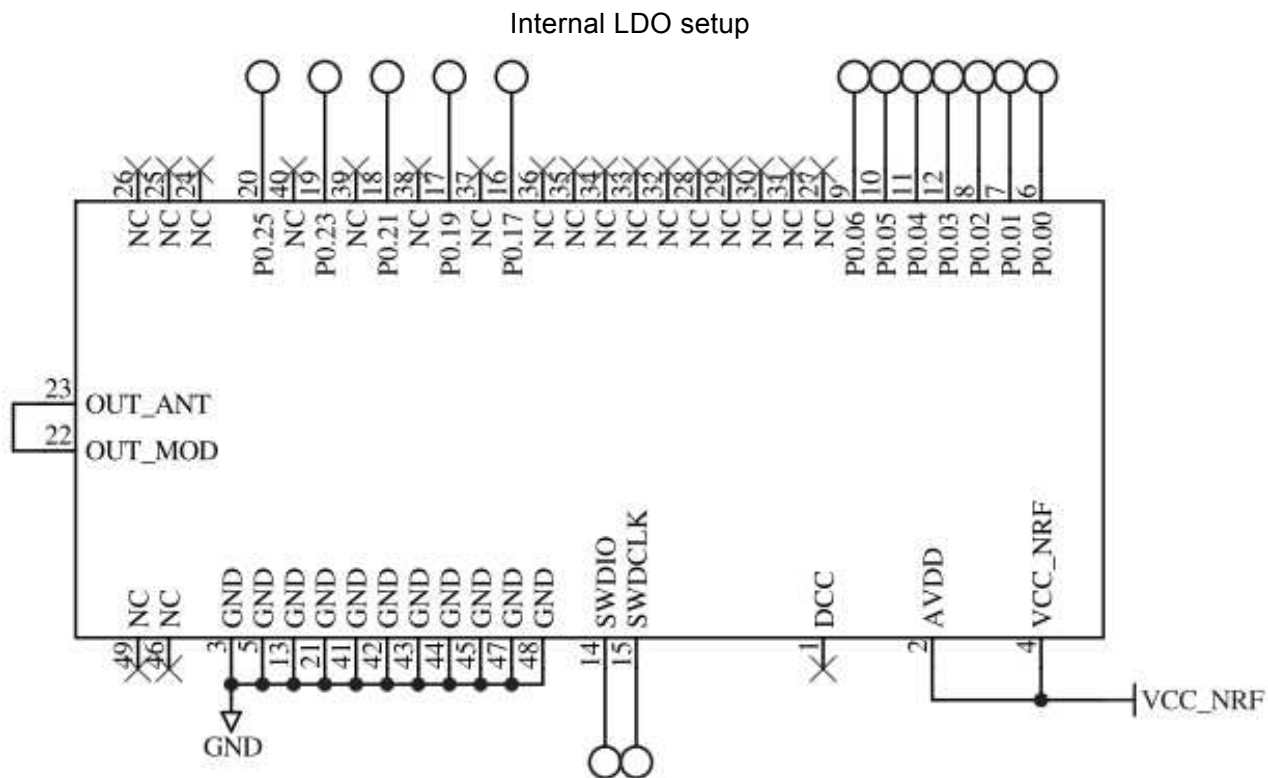
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EYSGCNAWY-1X

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Control No. HD-MC-A150104	(2/3)	Control name Circuit Schematic
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Sample circuits

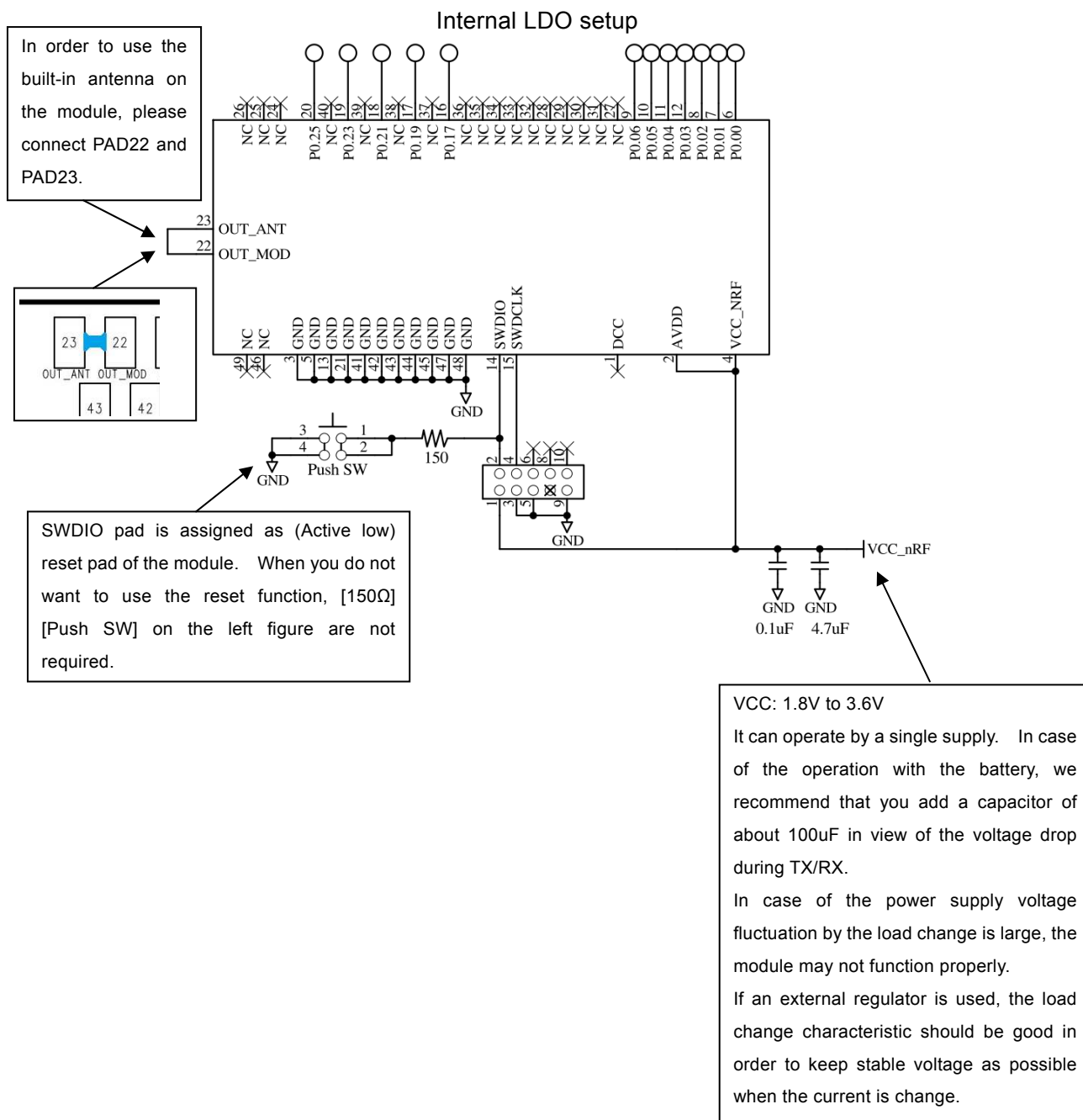


EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-MC-A150104	(3/3)	Control name Circuit Schematic
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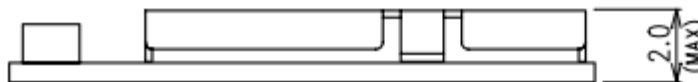
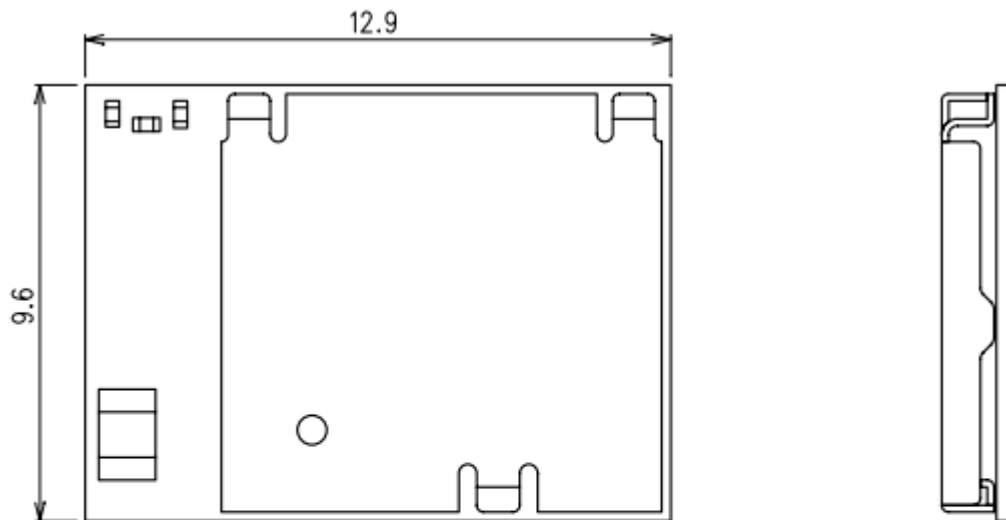
Reference Circuits



EYSGCNAWY-1X

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Control No. HD-AD-A150104 (1/3)	Control name Outline/Appearance
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Tolerance: +/- 0.2mm

Unit : (mm)

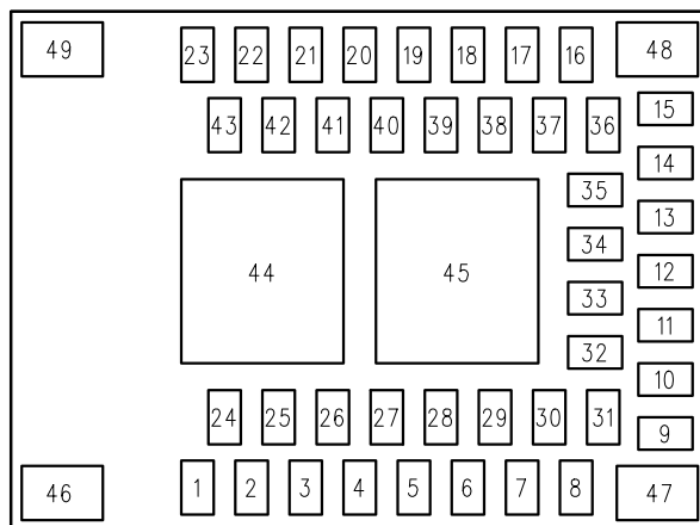
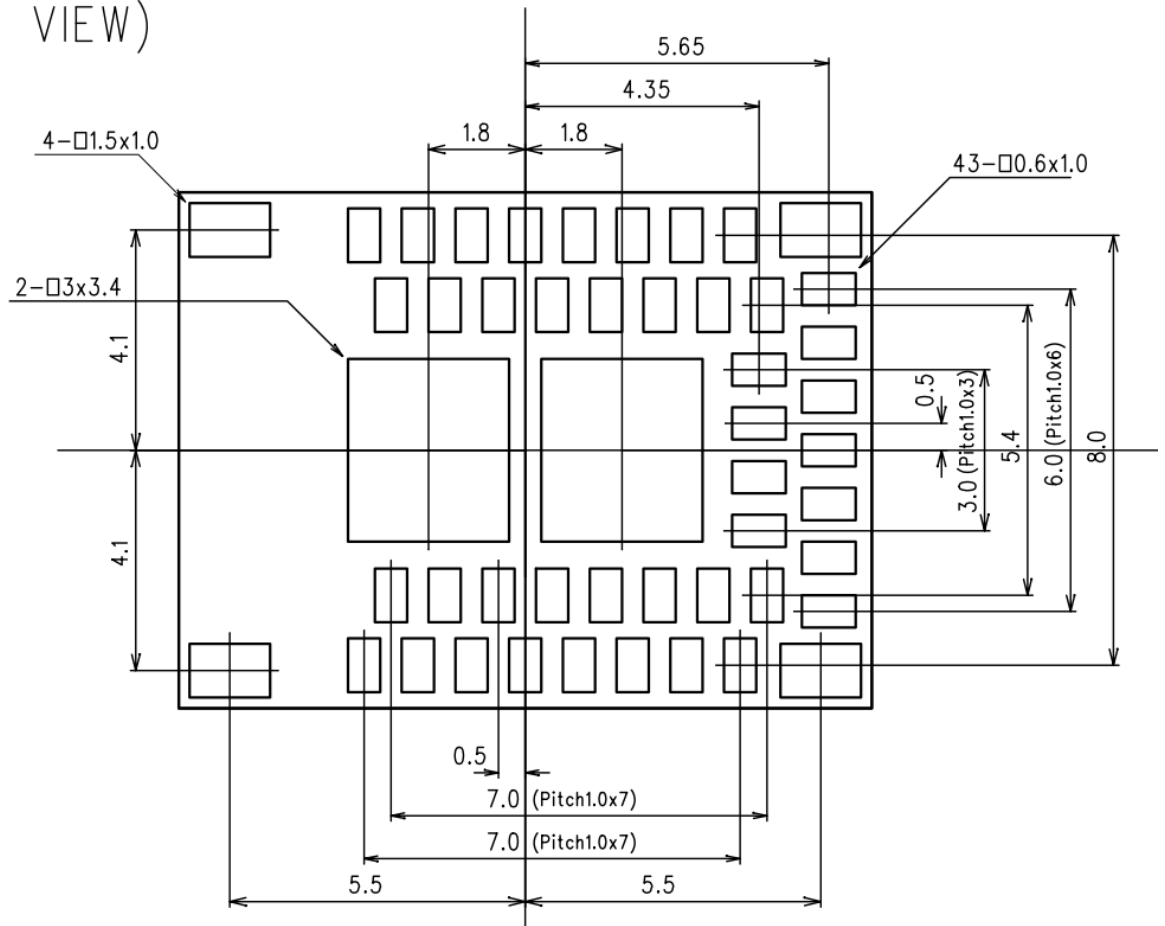
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EYSGCNAWY-1X

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Control No. HD-AD-A150104	(2/3)	Control name Outline/Appearance
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(TOP VIEW)



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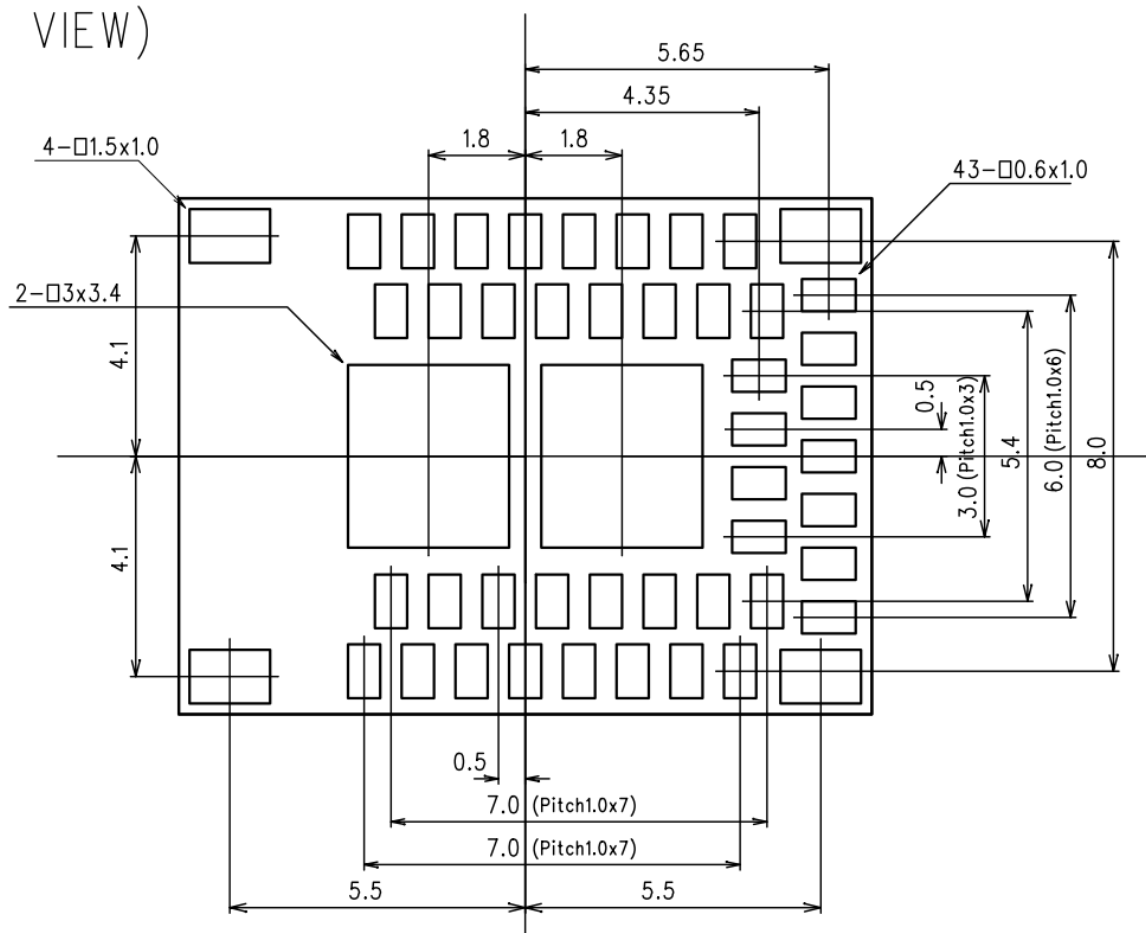
EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-AD-A150104	(3/3)	Control name Outline/Appearance
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LAND PATTERN EXAMPLE

(TOP VIEW)

**Recommended metal mask for solder printing**

Pad size	Mask opening
Signal pad 43 – 0.6 x 1.0 mm	0.5 x 0.9 mm
Corner pad 4 – 1.5 x 1.0 mm	1.0 x 0.7 mm
Center pad 2 – 3.0 x 3.4 mm	2.6 x 3.0 mm

The center of each mask opening is same as the pad center.

The metal mask thickness: $t=0.1\text{mm}$

The solder volume should be same by changing the mask opening if different metal mask thickness is used.

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EYSGCNAWY-1X

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Control No. HD-BA-A150104	(1/1)	Control name Pin Layout
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Pin Descriptions

Pin	Pin name	Pin function	Description
1	DCC	Power	Reserved
2	AVDD	Power	Analog Power supply
3	GND	Ground	Ground (0 V)
4	VCC_NRF	Power	Power supply
5	GND	Ground	Ground (0 V)
6	P0.00	Digital Output	UART_RTS
7	P0.01	Digital Output	UART_TX
8	P0.02	Digital Input	UART_CTS
9	P0.06	Digital Input	Disconnect request / Resume from Power saving mode
10	P0.05	Digital Output	Module active / sleep indicate
11	P0.04	Digital Input	Forced initialize / Request Sleep mode
12	P0.03	Digital Input	UART_RX
13	GND	Ground	Ground (0 V)
14	SWDIO	Digital I/O	System reset (active low). Also HW debug and flash programming I/O
15	SWDCLK	Digital input	HW debug and flash programming I/O
16	P0.17	Digital Input	Connection Parameter change (Peripheral) / Request DFU mode
17	P0.19	Digital Output	State indication of module / DFU indication
18	P0.21	Digital Input	Role switch / Sleep indication of host / Resume from Power saving mode
19	P0.23	Digital Output	Mode indication of module
20	P0.25	Digital Output	Wake up request
21	GND	Ground	Ground (0 V)
22	OUT_MOD	RF In/Out	RF I/O pin. It should be connected to Pin 23 OUT_ANT for normal operation.
23	OUT_ANT	Antenna In/Out	Internal antenna. It should be connected to Pin 22 OUT_MOD for normal operation.
24 to 40	NC	Not Connected	Reserved for future use
41 to 45	GND	Ground	Ground (0 V)
46	NC	Not Connected	Isolated pad on PCB for mechanical stability
47 to 48	GND	Ground	Ground (0 V)
49	NC	Not Connected	Isolated pad on PCB for mechanical stability

TAIYO YUDEN CO., LTD.

EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HQ-BA-537	(1/2)	Control name Handling Precaution
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This specification describes desire and conditions especially for mounting.

Desire/Conditions

(1) Environment conditions for use and storage

1. Store the components in an environment of < **40deg-C/90%RH** if they are in a moisture barrier bag packed by TAIYO YUDEN.
2. Keep the factory ambient conditions at < **30deg-C/60%RH**.
3. Store the components in an environment of < **25±5deg-C/10%RH** after the bag is opened.
(The condition is also applied to a stay in the manufacture process).

(2) Conditions for handling of products

Make sure all of the moisture barrier bags have no holes, cracks or damages at receiving. If an abnormality is found on the bag, its moisture level must be checked in accordance with 2 in (2).

Refer to the label on the bag.

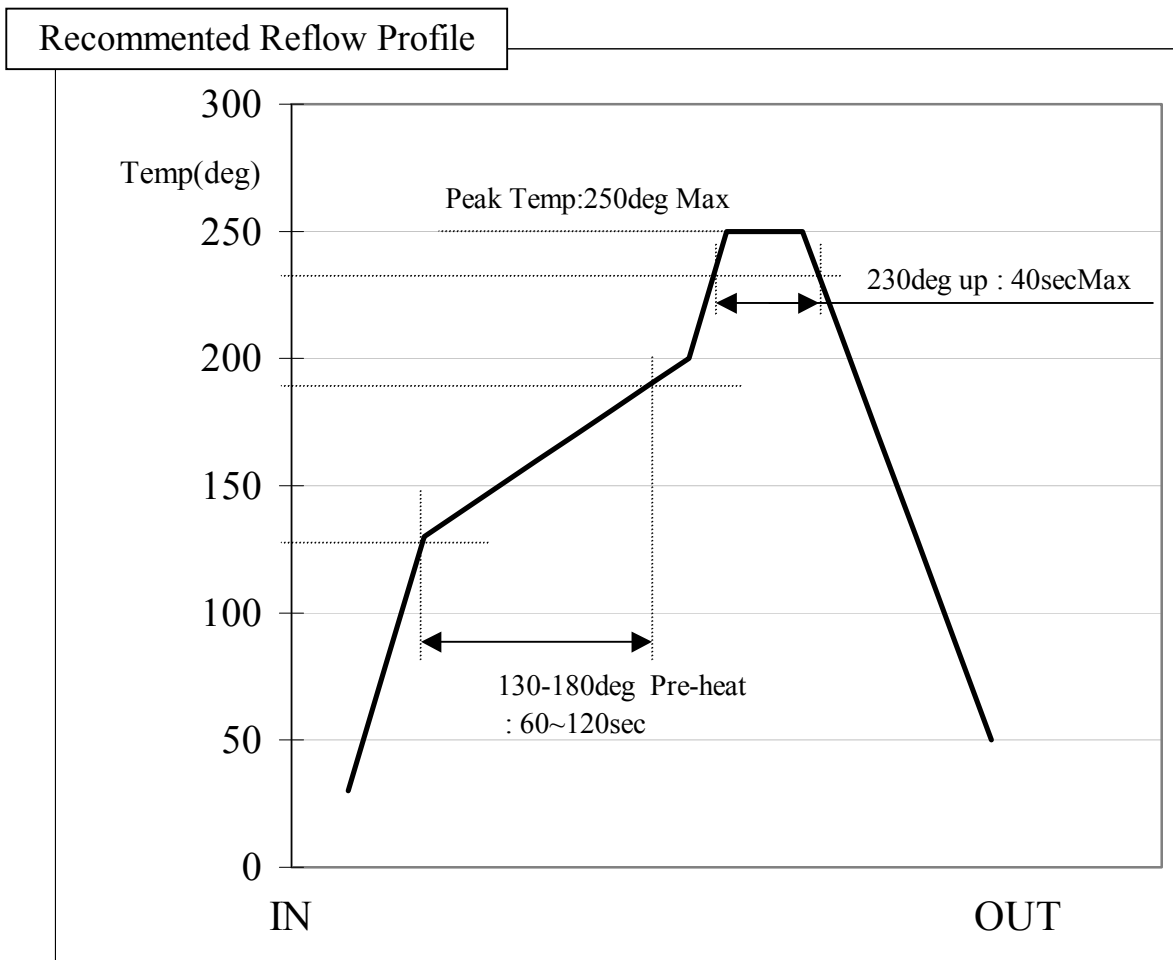
1. All of the surface mounting process (reflow process) must be completed **in 12 months** from the bag sea date.
2. Make sure humidity in the bag is less than **10%RH** immediately after open, using a humidity indicator card sealed with the components.
3. **All** of the surface mounting process (reflow process including rework process) must be completed in **168 hours** after the bag is opened (inclusive of any other processes).
4. If any conditions in (1) or condition 2 and 3 in (2) are not met, bake the components in accordance with the conditions at **125deg-C 24hours**
5. As a rule, baking the components in accordance with conditions 4 in (2) shall be once.
6. Since semi-conductors are inside of the components, they must be free from static electricity while handled.(<100V) Use ESD protective floor mats, wrist straps, ESD protective footwear, air ionizers etc. , if necessary.
7. Please make sure that there are lessen mechanical vibration and shock for this module, and do not drop it.
8. Please recognize pads of back side at surface mount.
9. Washing the module is not recommended. If washing cannot be avoided, please test module functionality and performance after thoroughly drying the module.
We cannot be held responsible for any failure due washing the module.
10. Please perform temperature conditions of module at reflow within the limits of the following.
Please give the number of times of reflow as a maximum of 2 times.

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EYSGCNAWY-1X

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Control No. HQ-BA-537	(2/2)	Control name Handling Precaution
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EYSGCNAWY-1X

TAIYO YUDEN CO., LTD.

Control No. HD-BB-A150104	(1/3)	Control name Packaging Specification
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Packaging Specification

梱包仕様

(1) Packaging Material 梱包材料

Name 部材名	Outline 概要	Materials 材質	Note 備考
Emboss エンボス	24mm wide - 12mmPitch 24mm幅 - 12mmピッチ	Conductive PS 導電性 PS	
Cover Tape カバーテープ			
Reel リール	φ 330 mm	Conductive PS 導電性 PS	
Desiccant 乾燥剤	30g×1		
Humidity indicator card 湿度インジケータ			
Aluminum moisture barrier bag アルミ防湿袋	420×460(mm)	(AS)PET/AL/NY/PE(AS)	
Label ラベル			
Corrugated cardboard box(Inner) 個装箱	339×351×74(mm)		
Corrugated cardboard box(Outer) 外装箱	369×369×277(mm)		

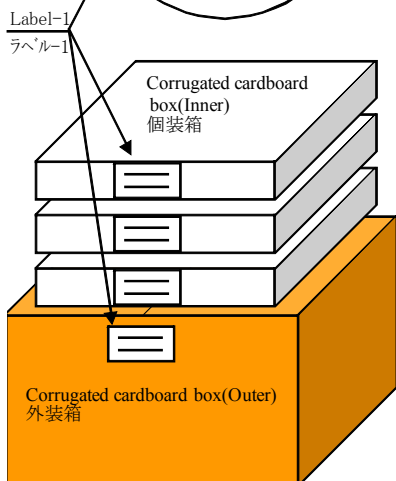
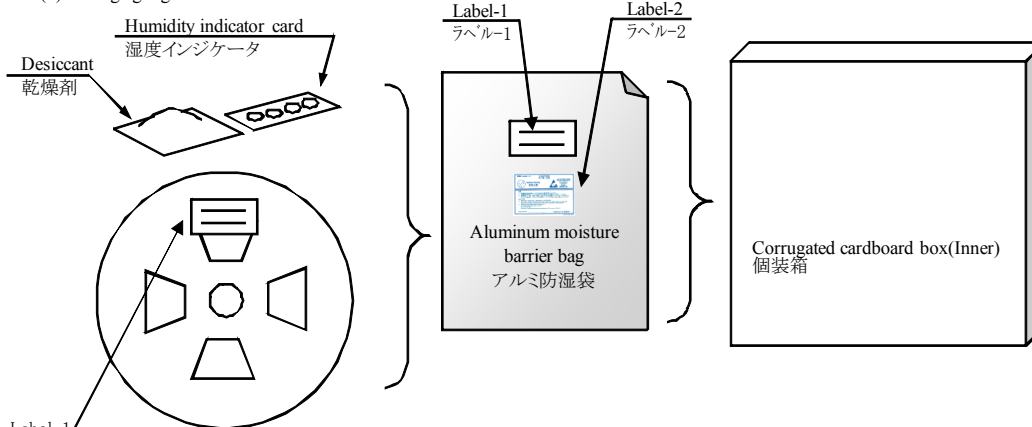
(2) Packaging Unit

梱包数量

Max 1000 pieces/Reel

Max 3000 pieces/Box(Outer)

(3) Packaging Figure



(4) Label

ラベル

Label-1

- COMPANY NAME 御社名
- PURCHASE ORDER 注文番号
- DESCRIPITON 品名
- QUANTITY 数量
- LotNo. ロット番号

Label-2

- CAUTION LABEL
注意ラベル
- MSL Level3

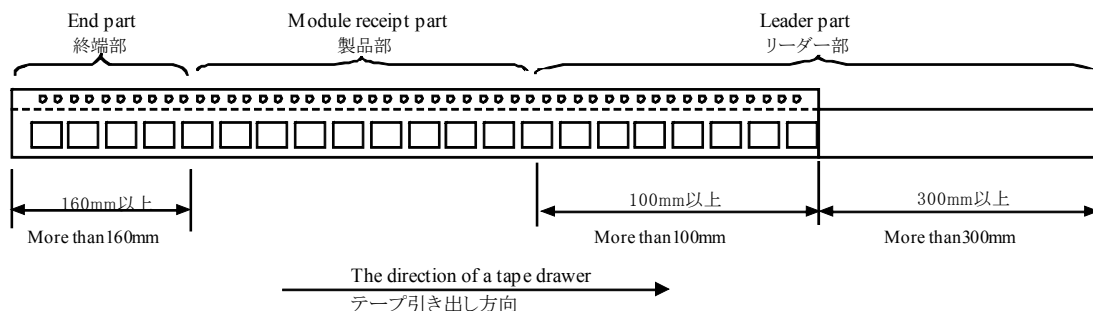
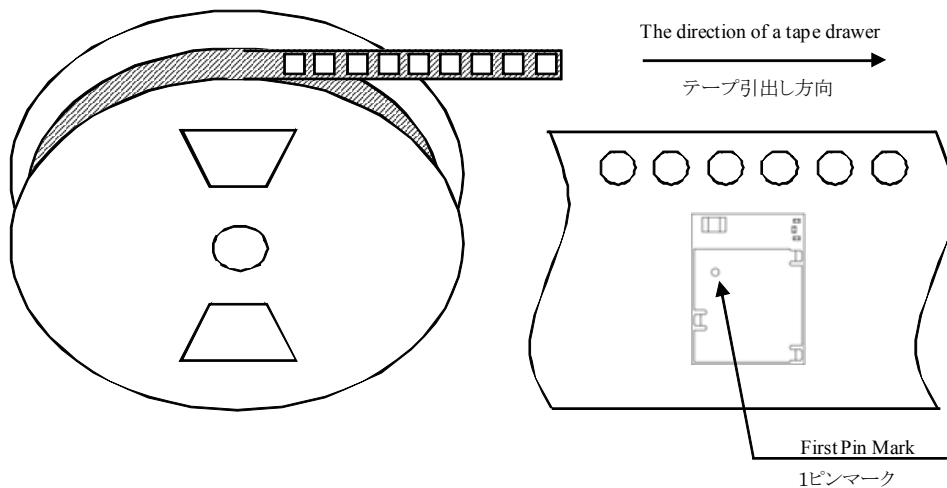
TAIYO YUDEN CO., LTD.

EYSGCNAWY-1X

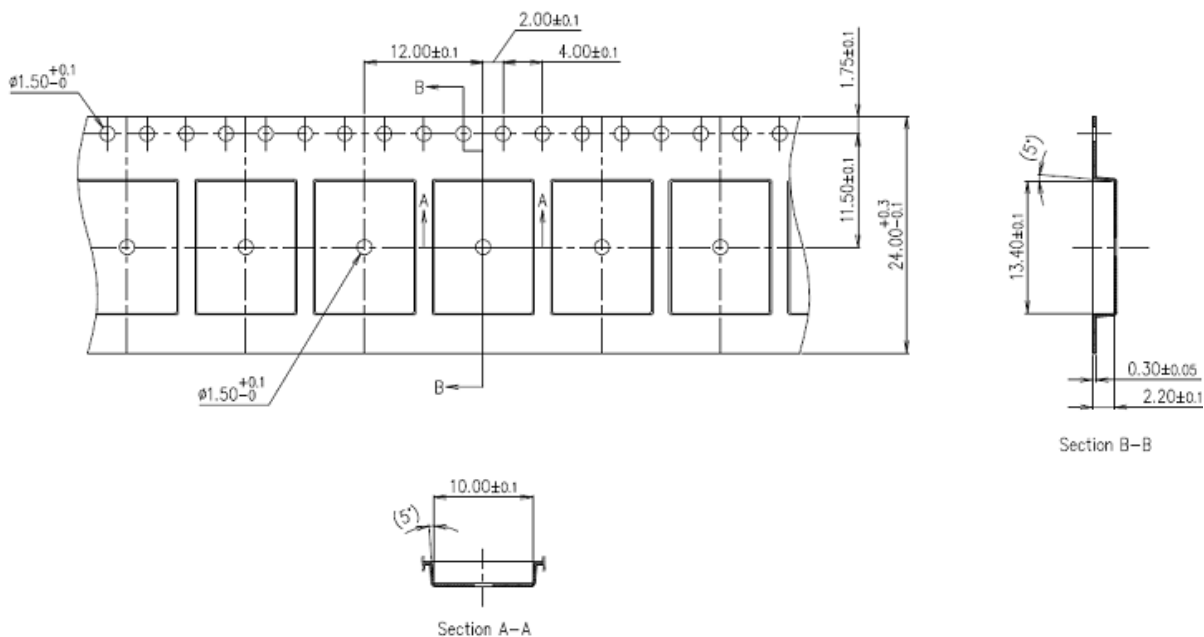
TAIYO YUDEN CO., LTD.

Control No. HD-BB-A150104	(2/3)	Control name Packaging Specification
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Tape specification
テーピング仕様



キャリアエンボス図面



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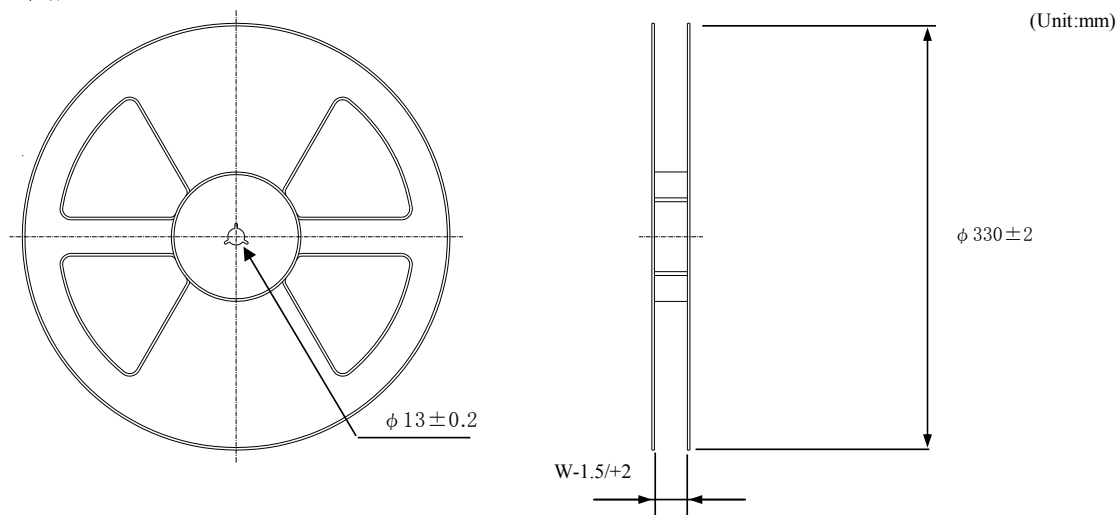
Control No.
HD-BB-A150104

(3/3)

Control name
Packaging Specification

Reel specification

リール仕様



Tape wide	8mm	12mm	16mm	24mm	32mm	44mm
W	9.4mm	13.4mm	17.4mm	25.4mm	33.4mm	45.4mm

Taping performance

テーピング性能

Both of an embossing tape top cover tape bear this, when the power of 10N is applied in the direction of a drawer.

- ・エンボステープ、トップカバーテープともに、引き出し方向に10Nの力を加えた場合に、これに耐えること。

The exfoliation adhesion of a top cover tape is the intensity of 0.1~1.3N.

(The angle to pull is 165~180 degrees. The speed to pull is 300 mm/min.)

- ・トップカバーテープの剥離強度は、角度165~180度に保ち、300mm/minのスピードでトップカバーテープを引っ張ったとき、0.1~1.3Nとする。

Note

備考

Lack of the parts in 1 reel is with two or less pieces.

1リール中の部品の欠落は2個までとします。(ラベル表示数量と梱包数は同じです。欠落とはテープ内でのモジュール抜けが2個まで許容させていただくという意味になります。)

MSL Level 3 Under control

MSL はレベル3 で管理しています。

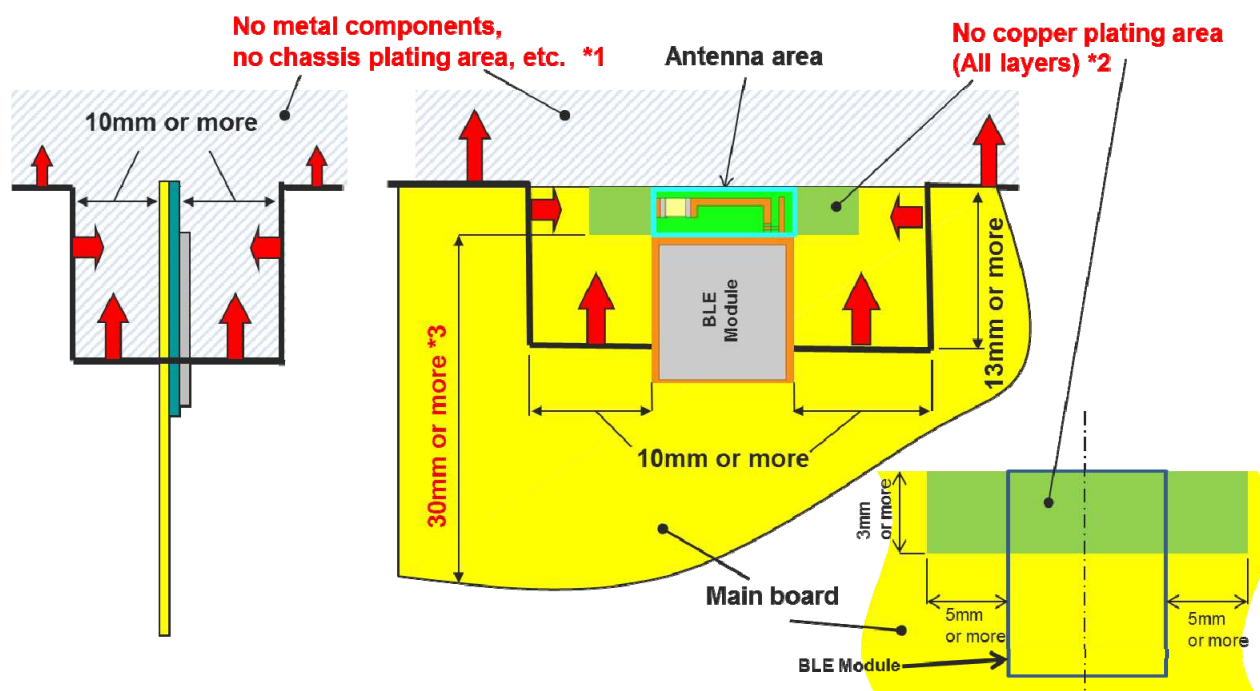
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Control No. (1/3)	Control name Antenna application note
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Recommended module mounting example



*1 Please do not place any metal components in blue shaded space,(*1) such as signal line and metal chassis as possible except for main board while mounting the components in *1 space on the main board is allowed except for no copper plating area. (*2).

*2 This area is routing prohibited area on the main board. Please do not place copper on any layer. Please remain use of FR-4 dielectric material. The antenna is tuned with the FR-4.

*3 Characteristics may deteriorate when GND pattern length is less than 30mm. It should be 30 mm or more as possible.

Even when above mentioned condition is satisfied, communication performance may be significantly deteriorated depending on the structure of the product.

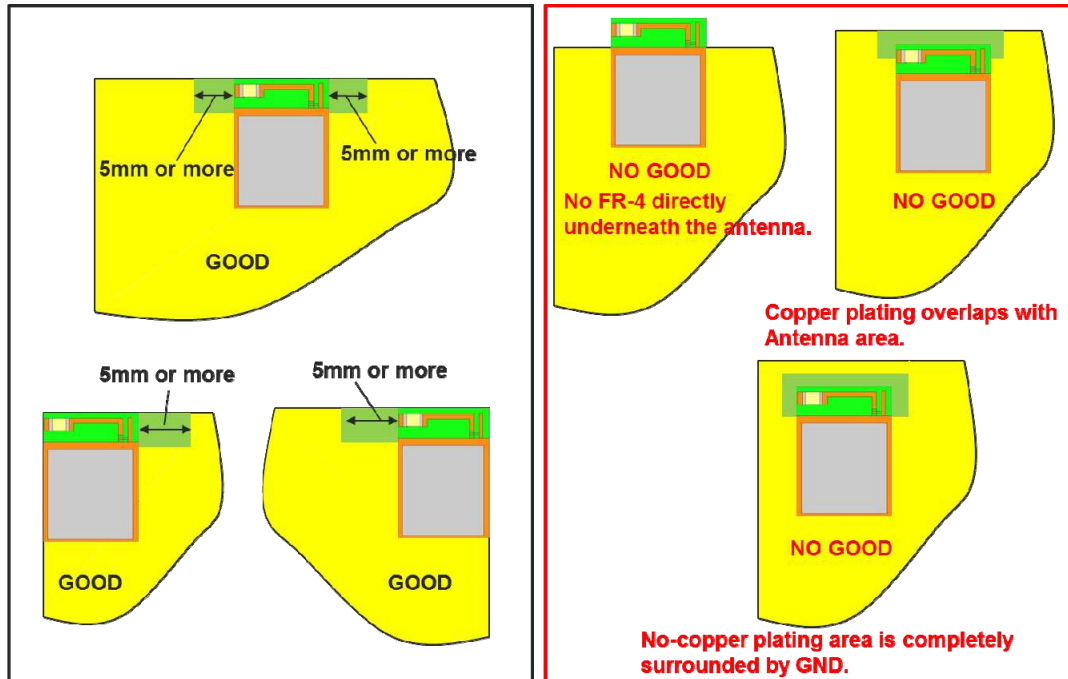
TAIYO YUDEN CO., LTD.

EYSGCNAWY-1X

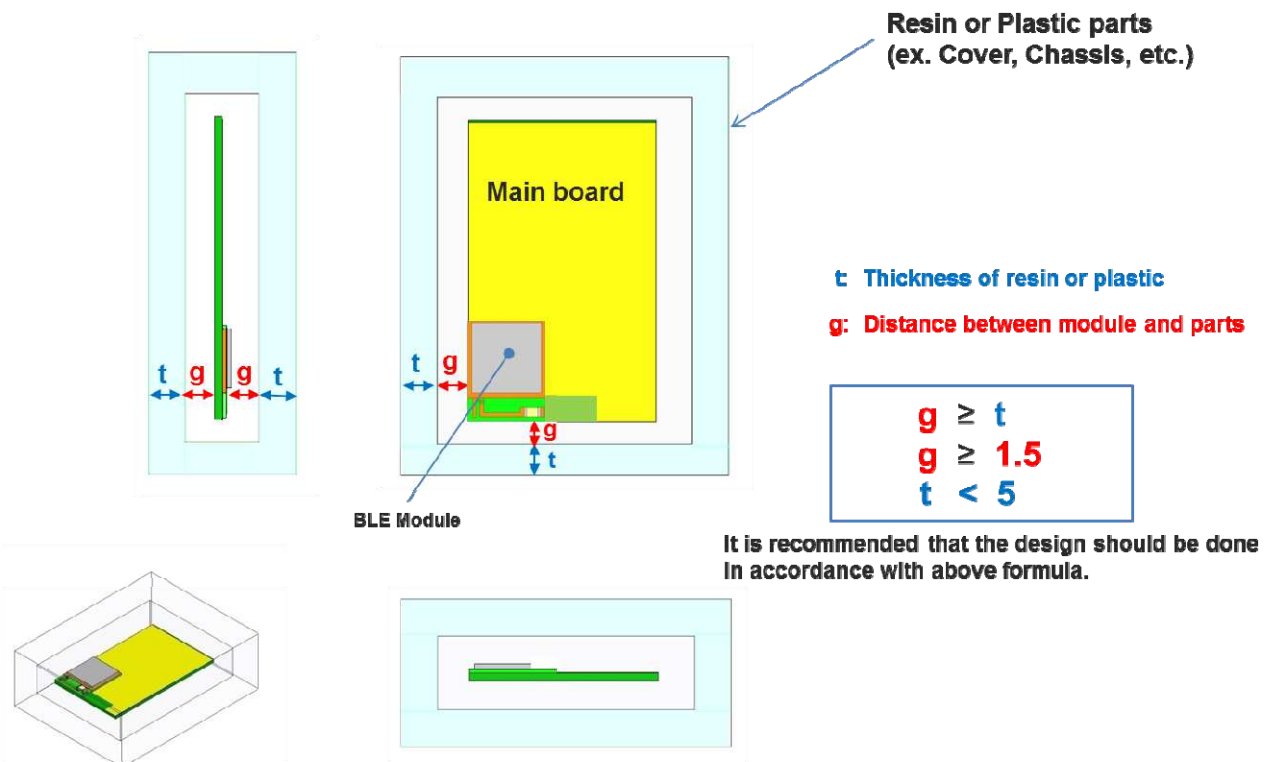
TAIYO YUDEN CO., LTD.

Control No. (2/3)	Control name Antenna application note
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Other module mounting examples



Placement of resin or plastic parts



Please do not apply molding over the antenna area of BLE module.

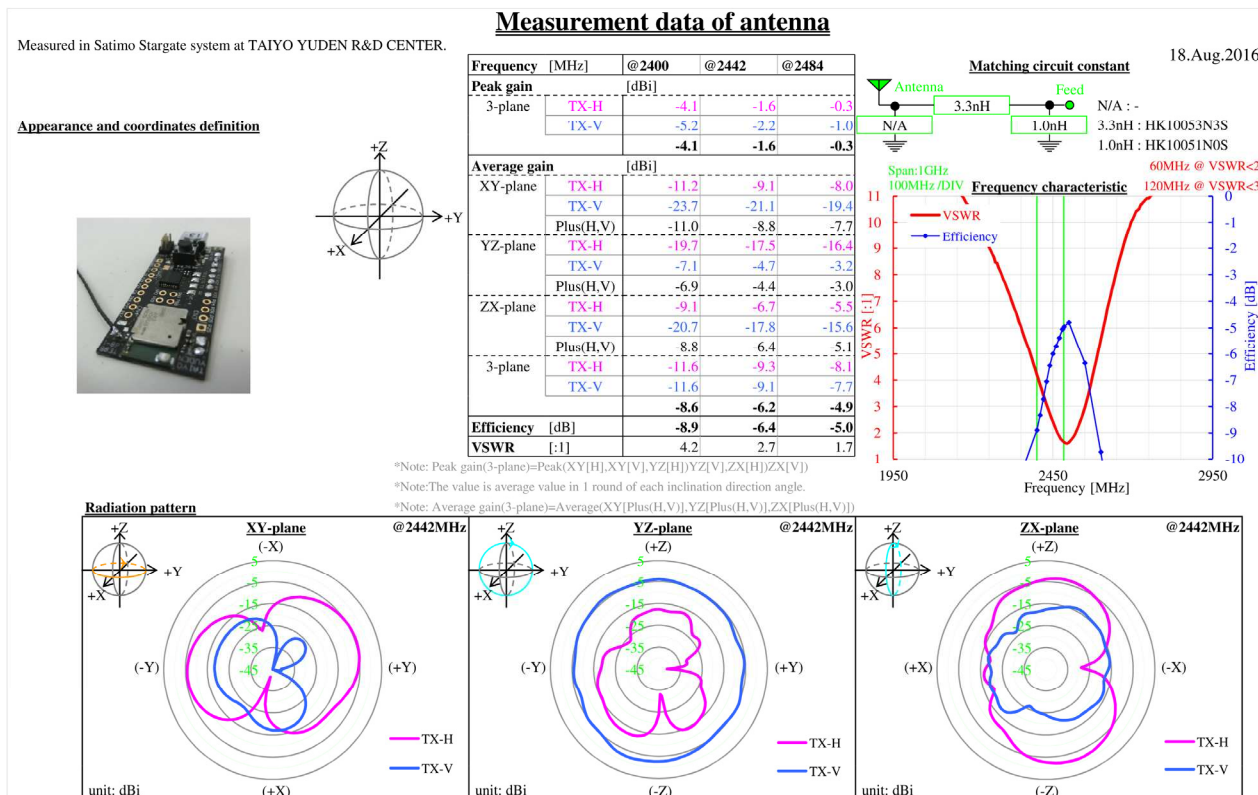
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TAIYO YUDEN CO., LTD.

Control No.	Control name
(3/3)	Antenna application note

Directional characteristics example (when mounted on evaluation board)



About this Application Note

- This Application Note has been prepared as a reference material to help obtaining the antenna performance mounted on BLE module better while it is not guaranteed or assured to obtain better communication performance and distance.
- This product “BLE module” has been certified and matching circuit constant for antenna within module cannot be changed when ambient environment condition changes. The product must be re-certified when matching circuit constant is changed.